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MEMORY, HISTORICALLY AND EXPERIMENTALLY CONSIDERED.

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I.

AN HISTORICAL SKETCH OF THE OLDER CONCEPTIONS OF MEMORY.

I.—*Early Allusions to Memory.*

Mnemosyne, Hesiod tells us, was the mother of the Muses. Without speculating, as some have done, about the reasons for this myth, it is interesting as showing an appreciation of the fundamental nature of memory, and some sort of crude introspective psychology dating back possibly to prehistoric times. Before the art of writing was in common use, men had to depend more largely than to-day upon their memories. It is not surprising, then, that the ancients put a high estimate upon memory before they began to theorize about its nature. There are allusions to memory in Homer and in the Hebrew Scriptures,¹ and occasionally one of the early Greek philosophers tries to explain some phenomenon of memory, but we find no scientific study of the subject before Aristotle.

The psychology of the Ionian school of philosophers, as far as they had any, was sensationalism. Their views of memory must be conjectured from the fundamental principles of their philosophy.

¹For references see Carus: *Geschichte der Psychologie*, pp. 150 and 169.

The doctrine of transmigration, as held by the Pythagoreans, was in some degree an anticipation of Plato's doctrine of reminiscence ; and Pythagoras's alleged belief that he remembered things that had happened in a former state of existence, would prove that he deemed memory an essential function of the soul, continuing beyond the limits of the present life.

Diogenes of Appolonia is said to have been puzzled by the phenomenon of forgetting. But, in accordance with the principles of his philosophy, he explained it by supposing that the cause of forgetting was an arrest of the equal distribution of air throughout the body. A corroboration of this explanation he found in the easier breathing that follows the recalling of what was forgotten.

Among the Eliatics, Parmenides is said to have held that not only thought, but recollecting and forgetting, depended upon the way the light or heat and the dark or cold are mixed in the body. If we may trust Theophrastus, every presentation, according to Parmenides, corresponded to a definite mixture relation of these qualities, and with the destruction of that relation the presentation disappeared, *i. e.*, was forgotten.¹

Heracleitus, one might suppose, would study memory carefully ; but, in the fragments of his philosophy that have come down to us, nothing is said upon the subject.

II.—*Plato's Doctrine of Memory.*

In Plato we find a more modern psychology. According to him, the thinking power of the mind, the understanding, is above the mere power of sense-perception. It is this power which compares and considers, notes

¹ Cf. Siebeck : *Geschichte der Psychologie*, 1er Th., 1e Abth.

similarities and contrasts, unity and plurality, and forms ideas of relation between Being and Non-being, as well as of relations of number and proportion. Among the elements of this higher power, recollection (*ἀνδρομνησας*) is of prime importance. It rests upon association by similarity or contrast and by simultaneity.¹

Plato distinguishes the passive retention of perceptions (*μνημη*) from active memory (*ἀνδρομνησας*),² and suggests as a definition of *memory*, "the power which the soul has of recovering, when by itself, some feeling which she experienced when in company with the body." He attempts no explanation of memory; but, in the *Theaetetus*, puts the following words into the mouth of Socrates:

"I would have you imagine, then, that there exists in the mind of man a block of wax, which is of different sizes in different men; harder, moister, and having more or less of purity in one than another, and in some of an intermediate quality. . . Let us say that this tablet is a gift of Memory, the mother of the Muses, and that when we wish to remember anything which we have seen, or heard, or thought in our own minds, we hold the wax to the perceptions and thoughts, and in that receive the impression of them as from the seal of a ring; and that we remember and know what is imprinted as long as the image lasts; but when the image is effaced or cannot be taken, then we forget and do not know."³

Plato carries out the same figure to explain different degrees of memory. When the wax in one's soul is deep, abundant, smooth, and of the right quality, the impressions are lasting. Such minds learn easily,

¹ *Phaedo*, 73 and 74.

² *Phileb.*, 34.

³ Jowett's translation.

retain easily, and are not liable to confusion. But, on the other hand, when the wax is very soft, one learns easily, but forgets as easily ; if the wax is hard, the reverse is true ; again, if the wax is hard or impure, the impressions are indistinct, and still more indistinct are they when jostled together in a little soul.

This illustration must not be taken too seriously, for later on in the same dialogue Socrates calls it a "waxen figment," and substitutes for it the figure of the aviary of all kinds of birds—"some flocking together apart from the rest, others in small groups, others solitary, flying anywhere and everywhere." This receptacle is empty when we are young. The birds are kinds of knowledge. Learning is the process of capturing the birds and of detaining them in this enclosure. In acts of memory we re-catch them and take them out of the aviary.

Plato's views upon memory have a special interest on account of their connection with his metaphysical doctrines. Perception and recollection are the occasion of the mind's turning away from the world of sense to the inner world of innate and universal ideas. These ideas we could never get from sense-perception. That gives us only the immediate and the individual. The ideas are of the essential and the universal. We could not conceive them if we did not already know them. Hence the power to know the universal in the individual proves a previous existence in which we had the intuitions of universal truths, and, accordingly, learning is but recollection.¹ The metaphysical aspects of memory, however, let us avoid as much as possible. They would soon lead far from a psychological study.

¹ For references see Zeller's *Plato and the Older Academy*, pp. 126, 407; cf. also Siebeck: *Geschichte der Psychologie*.

But this doctrine of recollection lies at the heart of the Platonic philosophy, and it is necessary to note carefully the distinction between it and ordinary memory. The latter as defined by Plato in the passage quoted above, is the memory or recollection of what has been learned through the body, *i. e.*, through sense-perception. It belongs to the world of appearances and is liable to many errors. The former, on the contrary, is not concerned with things of sense. It is recollection of that higher world where we had an antenatal vision of intelligible realities. Its highest manifestation is the insight of the philosopher who sees the divine goodness, truth, and beauty.¹

III.—*Aristotle on Memory.*

The difference of psychological method in Plato and Aristotle is seen in their treatment of the subject of memory. What Plato says of memory is incidental to the discussion of such profound matters as the nature of the soul and the theory of knowledge. Aristotle devotes a special tract to the subject of memory. While, according to Plato, memory is one of the higher faculties and partakes of the eternal nature of the soul, with Aristotle it is no longer a function of the eternal Nous, but has its seat in the *passive* reason, is dependent upon a physical process, and perishes with the body.

Aristotle seems to have been the first of ancient philosophers to write a systematic treatise on psychology. But, rather curiously, in this work on psychology there is no special treatment of memory. A special

¹ For the many passages in which the words *μνήμη*, *μνημονεύω*, *μνημονικός*, *μνήμων* occur in Plato, cf. Ast: *Lexicon Platonicum*, II., pp. 356, 357. For *ἀναμνήσκω* and *ἀνάμνησις* cf. the same, vol. I., pp. 151, 152.

tract,¹ however, was devoted to the subject. So far as we know, this was the first scientific study of memory ; and, for this reason, as well as for its intrinsic merits, the tract deserves special attention. But before passing to Aristotle's doctrine of memory, it is well to notice briefly his theory of sense-perception.

On occasion of appropriate stimuli, movements take place in the sense-organs. These movements, however, are not sense-perception. In perception the mind must compare and distinguish disparate sensations ; it must unite the sensations presented simultaneously by our double sense-organs, as of sight and hearing, and it must be conscious of sensation. This work of comparison, psychic synthesis, and self-conscious perception is performed by a central sense. The physical basis of this central sense is the heart. Through it the mind performs the act of sense-perception. Functions now attributed to nervous substance are referred by Aristotle to the *pneuma* connected with the blood. This is the medium by which the movements arising in the sense-organs are transmitted to the heart, and in this *pneuma* the movements persist after the external stimuli have ceased to act.

Incidentally it is interesting to note that, according to Aristotle's psychology, the brain has very little to do with mental activity ; to borrow a phrase from Wallace, it serves simply as " a cooling apparatus to counteract the excessive warmth of the heart."

When the movement occasioned in the sense-organ by an external stimulus is propagated to the heart,² a

¹ *De Memoria et Reminiscentia*. For a list of commentators, see Hamilton's edition of Reid's works, p. 891.

² The centre of touch and taste, according to Aristotle, is the heart. Sight, sound, and smell have their centre in the brain, but are indirectly connected with the heart.

perception occurs. Sense-perception, then, is an act of the soul by means of a physiological process. In the words of Aristotle, it is a "movement of the soul through the body."¹ This movement may continue after the stimulus which was the occasion of it has ceased to act. The extreme case is the well known phenomenon of a visual after-image. The images of the imagination are such after-sensations. Imagination is weak sensation, or, in the words of Hobbes, "decaying sense." So, too, dreaming is the result of a movement in our bodily organs, caused either from without or from within; and when the violent movements of the day are stilled, feebler movements that were ineffective during the waking hours may cause our dreams. Again, these persisting movements are the elements of memory. Memory and the imagination alike are dependent upon the residua of sensations. The subjective side of a sensation is an image. Thus the proper objects of memory, as well as of the imagination, are images (*φανταστά*). The image, according to Aristotle, is a condition (*πάθος*) of the central sense. Memory *per se* is of the original image or perception; only in an accidental manner does it relate to matters of thought. In other words, abstract ideas and the like are reproducible only so far as they imply images.

At first one wonders how Aristotle will distinguish those movements which constitute memory from those which are the basis of imagination. He is not entirely satisfactory on this point, but he makes this distinction: the picture of the imagination, or the corresponding movement, does not refer to an external object, and is not located in the past. The memory picture, on

¹ De Somno, 1, 454: ἡ δὲ λεγομένη αἰσθησις ὡς ἐνέργεια κίνησις τις διὰ τοῦ σώματος τῆς ψυχῆς ἐστίν.

the other hand, does refer to an object, and carries with it the consciousness of a time in the past when the perception remembered took place.¹ Memory, then, involves time, and both it and the sense of time are dependent upon the central sense.

In his special tract upon memory, Aristotle in part repeats Plato's views, in part discusses the obvious facts of memory which, having been continually repeated since his time, are now mere platitudes, and in part he tries to explain the phenomena of memory in accordance with his general system of psychology. The essay, however, is of special interest because in it Aristotle sets forth clearly the famous doctrine of the association of ideas. Some of the other points of the essay may be briefly mentioned, and special consideration given to the portion relating to association and recollection.

First, Aristotle takes a good deal of space to show, what would seem to be apparent enough to everybody, that memory is of the past, as perception is of the present, and hope and opinion of the future. He notes that the central sense, or sensorium, must be in a condition suitable to receive and retain the impressions. If the sensorium is too hard, no impression is made. If it is greatly agitated, the new movement is ineffectual—on somewhat the same principle, one may suppose, as we say in modern psychology that a weak stimulus is washed out by a strong one. Hence the very young and the very old have poor memories; for the former are in the movement of growth, the latter in that of decay. The question arises: How is it that in recollection we recognize the memory-image as a picture of the absent object? A scholastic answer is given.

¹ See Wallace's *Psychology of Aristotle*, Introduction, pp. 93-94.

“An animal painted in a picture, he says, is both an animal and a copy, and while being that one and the same, it is nevertheless two things at once. The animal and the copy are not identical, and we may think of the picture either as animal or as a representation. This also is true of the image within us; and the idea which the mind contemplates is something in itself, although it is also the image of something else.”¹

The second chapter of the treatise on memory is devoted chiefly to recollection and the association of ideas. Aristotle distinguishes carefully the mere persistence and direct reproduction of a presentation (*μνήμη*) from voluntary recollection (*ἀνάμνησις*). The latter is indirect reproduction. It is possible only by the association of ideas. The former is an attribute of animals, while the latter is peculiar to man. Recollection occurs according to the sequence of ideas.² What and how necessary the sequence shall be depends upon our past experience. “If the sequence be necessary,” Aristotle continues, “then when this movement occurs that one will follow. If it is not necessary, but a matter of habit, the latter movement will generally follow.”

Sir Wm. Hamilton understands the word translated *movement* (*κίνησις*) as meaning merely *change in quality*. The word, then, he thinks may be fairly translated into modern nomenclature by his famous term *modification*.

¹ Quoted from George Henry Lewes's Aristotle, p. 257.

² συμβαίνουσι δ' αἱ ἀναμνήσεις, ἐπειδὴ πέφυκεν ἡ κίνησις ἥδε γενέσθαι μετὰ τήνδε. This passage is obscure, but it is generally understood to refer to the sequence of motions or the corresponding ideas, and this interpretation agrees with the context. See Hamilton's edition of Reid, pp. 892, 893, and Themistius's Greek Paraphrase of De Memoria, quoted by Hamilton, pp. 893, 894; also Siebeck, Geschichte der Psychologie, Zweite Abtheilung, p. 77; Grote's Aristotle; Grant's Aristotle, p. 170.

One hesitates to criticise such a profound scholar and such a diligent student of Aristotle as Sir Wm. Hamilton ; but in the light of what has been said, it seems much simpler, and more in accordance with the psychology of Aristotle, to understand his doctrine of recollection as follows: The *physiological* movements originally connected with a series of perceptions must occur again in the same order when we recall a true memory picture.¹ Man is so constituted that when one movement and the mental image connected with it occurs, another movement with its appropriate mental image is likely to follow. When we would recall anything, then, we must call up idea after idea until we arrive at one upon which in our experience the one we are in search of has often been sequent. Or, in terms of physiology, movement after movement must occur until we arrive at a movement upon which the movement corresponding to the idea desired has often been sequent.

This sequence or association of ideas is subject to certain laws. The remarkable passage in which Aristotle states these laws is translated by Sir Wm. Hamilton as follows: " When, therefore, we accomplish an act of reminiscence, we pass through a certain series of precursive movements, until we arrive at a movement on which the one we are in quest of is habitually consequent. Hence, too, it is that we hunt through the mental train, excogitating [what we seek] from [its *concomitant in*] THE PRESENT OR SOME OTHER TIME, and from its SIMILAR OR CONTRARY OR COADJACENT. Through this process reminiscence is effected. For the movements [which, and by which, we recollect]

¹ Cf. Siebeck : *Geschichte der Psychologie*, 1er Th., 2te Abth., p. 77 seq.

are, in these cases, sometimes the SAME, sometimes at the SAME TIME, sometimes PARTS OF THE SAME WHOLE.”¹ Wallace, quoting the same passage in the introduction to his “Psychology of Aristotle,”² gives the following somewhat different and probably more accurate translation: “When engaged in recollection, we seek to excite some of our previous movements, until we come to that which the movement or impression of which we are in search was wont to follow. And hence we seek to reach this preceding impression by starting in our thought from an object present to us, or something else whether it be similar, contrary, or contiguous to that of which we are in search; recollection taking place in this manner because the movements are in one case identical, in another case coincident, and in the last case partly overlap.”³ Which-ever translation we adopt, it seems plain enough that Aristotle maintained that voluntary recollection depends upon association by *similarity*, *contrast* or *contrariety*, and *contiguity*. Very likely he meant to include association by *simultaneity* and *sequence*; but any proof of this should rest upon the words used in the text and the general import of the passage, rather than upon doubtful emendations like some of Hamilton’s.⁴

A more important question is whether Aristotle meant to limit the application of these laws to voluntary recollection (*ἀνάμνησις*), or whether he intended to

¹ The Greek is, διὸ καὶ τὸ ἐφεξῆς θηρένομεν νοήσαντες ἀπὸ τοῦ νῦν, ἢ ἄλλου τινὸς καὶ ἀφ’ οὐμοίου, ἢ ἐναντίου, ἢ τοῦ σύνεγγυς· διὰ τοῦτο γίνεται ἡ ἀνάμνησις. αἱ γὰρ κινήσεις τούτων τῶν μὲν αἱ αὐταί, τῶν δ’ ἅμα, τῶν δὲ μέρος ἔχουσιν.

² p. 95.

³ See also Grote, Grant, Siebeck, and Zeller, op. cit.

⁴ After ἢ ἄλλον τινὸς in the passage cited above, Hamilton would supply χρόνον or καιροῦ.

include spontaneous reproduction (*μνήμη*) as well. The opinion commonly held by students of Aristotle, from Themistius down, seems to have been that he applied the law of association only to voluntary recollection. Hamilton, however, argues forcibly that Aristotle taught the universality of the law of association. It seems natural enough to suppose that one who saw so clearly that in the voluntary train of thought the sequence conforms to the law of association, would have seen that the same laws apply to the spontaneous activity of the mind. But, while Aristotle states the law of association clearly for the former, he at most merely alludes to the latter, and obscurely enough at that.

Later in the same treatise, Aristotle gives an illustration that may serve to elucidate the principles of association as he understood them. In recollection there are certain starting-points or clues. Milk suggests whiteness, whiteness the clear atmosphere, the atmosphere moisture, that the rainy season. So, too, Themistius, in commenting upon the passage quoted above, uses an illustration somewhat similar : "I see a painted lyre, and moved by this as the prior and leading image, I have the reminiscence of a *real lyre*; this suggests the *musician*; and the musician the *song* I heard him play."¹ Again, Aristotle uses an illustration somewhat as follows : Let A, B, C, D, E, F, G, H represent a series of ideas, one of which we wish to recall. From DE as a starting point, we may be moved forward by E, or backward by D, by the association of ideas. If, then, on the suggestion of DE we do not find what we would recall, we may find it by running over the series E... H; if not, we shall at any rate

¹ Quoted by Hamilton, Reid's Works, p. 901.

find the desired idea by running backwards from D to A. Not much stress, however, should be put upon this last illustration, for the text is so obscure that many different interpretations have been given by commentators. Perhaps Aristotle meant to illustrate something more profound than the mere linkings of presentations in a series and the process of recalling the mental train; but the illustration of such a simple matter as this was not unimportant in the first scientific study of memory. Such commonplace illustrations, however, would hardly be worth repeating, were it not that many have thought the doctrine of association a modern discovery. We have already seen that Plato refers to this doctrine. We shall soon see that St. Augustine held that without the presence of an associated idea we cannot recall a desired thought.

The place of memory in the Aristotelian psychology in relation to the lower psychic activities, is plain from what has been said. The relation of memory as voluntary recollection to the higher activity of the intellect is indicated by Aristotle when he says that recollection is a syllogistic process. Thus it is that while many animals have the lower kind of memory, man alone has the higher form. "The reason is," says Aristotle, "that reminiscence is, as it were, a kind of syllogism or mental discourse. For he who is reminiscient that he has formerly seen or heard or otherwise perceived anything, virtually performs an act of syllogism."¹ With Aristotle, the higher functions of the soul are based upon the lower. "Without nutrition there is no sense, without sense there is no phantasy, without phantasy there is no cogitation or

¹ Hamilton's translation, Vol. II, p. 909, op. cit.

intelligence.”¹ The place of memory among the soul’s functions is with the phantasy or imagination mediate between sensation and intelligence.

In connection with Aristotle’s doctrine of recollection, one passage in his *Psychology* is interesting, although its importance has, perhaps, been exaggerated. “Recollection,” he says, “starts from the soul, and terminates in the movements or impressions which are stored up in the organs of sense.”² Siebeck interprets this passage as meaning that the soul has the power by means of the heart to effect a sort of efferent movement towards the sense organs, and thus to arouse anew the persisting residua of former motions. Recollection, then, with Aristotle, as in modern psychology, is an excitation, reproduced in a less degree, of the sense organs ; and the same organs are excited and the same movements repeated as in the original sensation.³ This passage is certainly a remarkable anticipation of Bain’s famous doctrine that a reproduced impression “occupies the very same parts, and in the same manner” as the original impression.⁴

In the foregoing sketch of Aristotle’s view of memory, the attempt has been made to give only what can fairly be found in Aristotle’s text. Much of his tract upon memory is obscure. Commentators have held very conflicting opinions in regard to the importance of what he wrote upon association and recollection. Sir William Hamilton calls him the “founder and the finisher of the theory of association,” looks upon the commentators as marvellously stupid in their interpre-

¹ Grote, *op. cit.*, p. 211.

² Wallace : *Aristotle’s Psychology*, p. 41.

³ Siebeck, *loc. cit.*, pp. 78-79.

⁴ Bain : *The Senses and the Intellect*, p. 338.

tations, and deems it a proof of Aristotle's genius that it took the world 2000 years to become intelligent enough to understand him. In reading Hamilton's erudite discussion, one may be led almost to believe that Aristotle was the first Scottish philosopher. But, while Hamilton's Scottish apperception probably found too much in Aristotle's treatise, and while, on the other hand, Lewes may be right in saying that "here, as in so many other cases, modern knowledge supplies the telescope with its lenses," nevertheless Aristotle's doctrine of association was a valuable contribution to science, and it is manifestly unfair to charge him with ignorance of its importance because he did not spin out as many volumes upon the subject as the English Associationalists have done.¹

IV.—*Conceptions of Memory among the Stoics and Epicureans, and in Cicero and Quintilian.*

The Stoics took Plato's figure of the wax almost literally. They held that the mind is originally a *tabula rasa*. Sensations are the first writing upon this tablet. The object of sensation makes an impression upon the perceiving subject as the seal impresses the wax. Memory depends upon this impression. This was the view of Zeno. Chrysippus found difficulties in such a crude materialistic theory. How could the mind receive and retain at the same time a number of different and partly incompatible impressions? Accordingly he replaced this view by the theory that the sense impression consists in a qualitative change (*ἀλλοίωσις*)

¹ For passages where the words *μνήμη*, *ἀνάμνησις*, etc., occur in Aristotle, see the index in the Berlin edition of Aristotle's Works, Vol. V. In addition to the works cited, see also Waddington-Kastus; *De la psychologie d'Aristote*, Chap. XIII.

of the passively receiving organ, the soul.¹ The presentation (*φάντασμα*) is a state of the soul. The relation of memory to the general theory of knowledge, with the Stoics, was briefly as follows : The lowest act of the soul is mere perception (*αἴσθησις*); the next is presentation (*φαντασία*), which adds conscious observation, its function being to make a first test of the truth of the material furnished by sense. If perception has offered a true picture of the external object, this presenting activity of the mind becomes so intensive that the understanding is brought into action. The understanding or judgment approves or disapproves the presentations. If it approves, then arises the empirical fact, which bears upon it the mark of truth. These facts memory stores up. By combination of the separate facts, empirical concepts are formed, which make up the treasure of memory or experience.²

The psychology of Epicurus and the other atomists was a simple kind of mechanical sensationalism. Eidola or images from external objects enter the soul through the sense organs. The mind stores up a great multitude of these eidola. Whenever we call up a picture of memory or the imagination, we turn the attention to one of these images. Thus the mind sees in the same way that the eye does, with this difference, that it perceives much thinner eidola.³

Cicero and Quintilian⁴ both dwell upon the importance of memory, and both seem to adopt the common

¹ For references see Siebeck's *Geschichte der Psychologie*, p. 209. See also Ueberweg : *History of Philosophy*, Vol. I, p. 193.

² Cf. Stein : *Die Erkenntnistheorie der Stoa* ; Zeller : *Stoics, Epicureans, and Skeptics* ; and Ueberweg, loc. cit.

³ Lucretius, IV, 750 seq.

⁴ Cicero : *De Oratore*, II, 86 seq. ; also *Rhet. ad Herenn.*, III, 16-24 ; Quintilian : *Instit.*, XI, 2.

theory of the time, that impressions are stamped on the mind as the signets are marked on wax. They are especially concerned, however, with principles relating to the exercise of memory, and they give instructions for mnemonic aids in oratory. Cicero lays special stress upon order as an aid to memory ; and, as sight is the most acute of the senses, those things are best remembered which are visualized by the imagination. In accordance with the ancient mnemonic systems, he would have these imagined forms localized. The advice of Quintilian in respect to memory is especially sensible. According to him, nothing can take the place of exercise and labor. Next in importance is the division and arrangement of one's subject. He notices also the importance of good health ; and says that for slow minds, an interval of rest after study is a good thing to perfect the memory.

V.—*Plotinus on Memory.*

The Neo-Platonic psychology of memory is represented by Plotinus.¹ He discusses the subject at considerable length and presents a somewhat original doctrine. Memory does not belong to God, nor to the divine immutable intelligence in man which knows by direct intellectual perception. It is a function of the soul, and first appears when the world-soul is individualized in bodies. Memory, however, has no basis in the physical organism, nor does the soul impress the sensations upon the body. The effects of sensations are not like impressions made by a seal, nor are they reactions (*ἀνταρρέσεις*) or configurations (*τυπώσεις*), but the mode of sense-perception is like that of intellectual activity. In memory, too, the soul is active, not pas-

¹ Cf. Enn. IV, L. III, C. XXV-XXX, and L. VI.

sive. The influence of the body proves nothing against this. The changeable nature of the body may cause us to forget, but it cannot condition positive recollection. The body is the river of Lethe, but memory belongs to the soul. The part of the soul to which memory belongs is the image-forming faculty. This holds sense-impressions as well as thought. Two souls, the higher and the lower, are concerned in memory. When the soul leaves the body, the recollections of the lower soul are soon forgotten, in proportion as the higher soul rises toward the intelligible world.

VI.—*St. Augustine on Memory.*

St. Augustine developed the views of the Neo-Platonists in regard to memory. With him, memory is a faculty of animals, men and angels. God, whose immutable essence is above the sphere of movement and change, does not remember. Everything is seen by him in one indivisible and unchangeable present. Augustine does not agree with Aristotle that some animals are devoid of memory. He attributes memory even to fishes, and relates, in confirmation of this opinion, an incident that he had observed. There was a large fountain filled with fishes. People came daily to see them and often fed them. The fishes remembered what they received, and as soon as any one came to the fountain they crowded together, expecting their accustomed food. But Augustine does not suppose that animals have that higher memory which is purely intellectual, although he probably failed to see how purely mechanical and involuntary their so-called acts of memory are.

Memory, with St. Augustine, as in the psychology

of Plotinus, is a function of the soul, not of the body. But, with Aristotle, he refers it to a seat in the physical organism.¹

What is memory ? It is thinking of what one knows. All the various modifications of the soul cannot all be present to us at once. There is a difference between knowing a thing and thinking of it. The musician, says Augustine, knows music, but he does not think of it when he is talking about geometry.² The ideas relating to music are in the mind in a latent state. Augustine anticipates Leibnitz in discussing the unconscious modifications of our ideas ; but he speaks especially of their gradual decay, while Leibnitz considers the unconscious growth of them. “ Many numbers,”³ he says, “ are gradually effaced from memory, for they remain not an instant unaltered. Indeed, what is not found in memory after a year is somewhat diminished even after one day. But this diminution is imperceptible ; yet it is not wrongly inferred, for it does not suddenly all vanish the day before the year is up. Hence we may conclude that from the moment it was engraved in memory it began to slip away.”⁴

The doctrine of unconscious mental changes and of unconscious mental states is one of the most remarkable features of Augustine’s psychology. With irresistible logic he demonstrates the existence of such states in the following passage from another place : “ But what when the memory itself loses anything, as falls

¹ The seat of memory, with Augustine, however, is in the brain, not in the heart, as with Aristotle.

² *De Trin.*, L. XIV, C. VII. See also Ferraz : *Psych. de St. Augustin*, 2d ed.

³ Augustine does not mean to limit what follows to mathematical truths, but, according to his psychology, the same would be true of anything that we are liable to forget.

⁴ *De Musica*, L. VI, C. IV.

out when we forget and seek that we may recollect? Where in the end do we search but in the memory itself? and there, if one thing be perchance offered instead of another, we reject it, until what we seek meets us; and when it doth, we say, 'This is it,' which we should not unless we recognized it, nor recognize it unless we remembered it. . . . For we do not believe it as something new, but, upon recollection, allow what was named to be right. But were it utterly blotted out of the mind, we should not remember it, even when reminded. For we have not as yet utterly forgotten that which we remember ourselves to have forgotten. What, then, we have utterly forgotten, though lost, we cannot even seek after."¹

It would not be difficult to find passages in modern psychologies that read almost like translations of this chapter of Augustine's Confessions.

Two kinds of memory—sense-memory and intellectual memory—are distinguished in the Augustinian psychology. The former preserves and reproduces not only the images of visible objects, but also the impressions of sounds, odors, and other objects which strike our senses.² The images are not like the *eidola* of Democritus, but are ideal, formed by the mind from its own essence. Intellectual memory contains our knowledge of the sciences, of literature and dialectic, and of the questions relating to these subjects.³ This memory, unlike the memory of sense, contains not the images of things, but the things themselves. These ideas which the intellectual memory stores up are in a sense innate. They never came to us through the senses. They could never have been taught to us

¹ Conf., *L. X, C. XIX.* Pusey's translation.

² Conf., *L. X, C. VIII.*

³ Conf., *L. X, C. IX seq.*

unless we had already had them in our memories. "When I learned them, I gave not credit to another man's mind, but recognized them in mine." Thus the memory contains the idea of truth and of God.

Augustine points out too, what has been repeated by Locke and others until it has become a platitude, that we do not remember objects themselves, but the ideas which we have obtained from them. And with his usual subtlety he shows that much of what is ordinarily attributed to perception is really the work of memory.

A French psychologist who has made a special study of St. Augustine, says: "We see what importance St. Augustine attaches to memory. It is, in his view, the faculty which preserves the ideas relating not only to the body but to the soul, not only to eternal truths but to the eternal Being himself. . . . This memory which is peculiar to man and which animals do not possess, this memory which in a mysterious manner contains in it intelligible realities, is, according to the Bishop of Hippo, one of the three great faculties of man and the origin of the other two. It is from it that intelligence arises, and the will proceeds from the one to the other and unites them. Thus, if it is allowed to compare things human with things divine, we have in us an image of the august Trinity. Memory, in which is the matter of knowledge, and which is as the place of intelligible things, offers some resemblance to the Father; the intellect, which is derived and formed from it, is not without analogy to the Son; and love or will, which unites the memory to the intellect, has a certain resemblance to the Holy Spirit."¹

The well known conditions of a good memory, such as acuteness of sensation, order, and repetition, Augus-

¹ Ferraz: *Psych. de St. Augustin*, p. 178; cf. also *De Trin.*, *L. XV, C. XXI, XXII, XXIII*, and *L. XI, C. VII and VIII*.

tine notices only incidentally. More attention is given to the relation of the will to memory and to the association of ideas.

Whether we remember or not depends upon the will. By an act of will we avert the memory from sense-perceptions ; as, for example, when we hear a speaker and do not notice what he says, or read a page and do not know what we have read, or walk with our attention upon something else. In all these cases we perceive, but do not remember our perceptions. So, too, recollection depends upon the will: "As the will applies the sense to the body (*i. e.*, external object), so it applies the memory to the sense, and the eye of the mind of the thinker to the memory."¹

This power of the will over memory is, however, limited by the association of ideas. In order to recall anything by a voluntary effort, we must remember the general notion of the thing or some associated idea. "For example, if I wish to remember what I supped on yesterday, either I have already remembered that I did sup, or if not yet this, at least I have remembered something about that time itself ; if nothing else, at all events I have remembered yesterday, and that part of yesterday in which people usually sup, and what supping is."² In another place he says that of a series of ideas the lost part is recovered "by the part whereof we had hold."

Many since Augustine have marveled at the miracle of memory. None have expressed their admiration more eloquently. "Great is this force of memory," he exclaims, "excessive great, O my God! a large and boundless chamber : who ever sounded the bottom

¹ De Trin., L. XI, C. VIII. Pusey's translation.

² De Trin., L. XI, C. VII. Pusey's translation.

thereof? . . . A wonderful admiration surprises me, amazement seizes me upon this. And men go abroad to admire the heights of mountains, the mighty billows of the sea, the broad tides of rivers, the compass of the ocean and the circuits of the stars, and pass themselves by ; nor wonder that when I spake of all these things I did not see them with mine eyes, yet could not have spoken of them unless I then actually saw the mountains, billows, rivers, stars which I had seen, and that ocean which I believe to be, inwardly in my memory, and that, with the vast spaces between, as if I saw them abroad. Yet did not I by seeing draw them into myself, when with mine eyes I beheld them ; nor are they themselves, with me, but their images only. And I know by what sense of the body each was impressed upon me.”

It is an interesting fact that Augustine noticed the possibility of illusions of memory. Certain rare phenomena—the so-called recollections of Pythagoras and others who were said to have remembered objects perceived by the senses in a former state of existence—he explains in a very modern fashion, except that he attributes these beliefs to the agency of evil spirits. “For we must not,” he says, “acquiesce in their story who assert that the Samian Pythagoras recollected some things of this kind which he had experienced when he was previously here in another body ; and others tell yet of others that they experienced something of the same sort in their minds. But it may be conjectured that these were untrue recollections, such as we commonly experience in sleep, when we fancy we remember as though we had done or seen it, what we never did or saw at all ; and that the minds of these persons, even though awake, were affected in this way at the suggestion of malignant and deceitful

spirits, whose care it is to confirm or to sow some false belief concerning the changes of souls, in order to deceive men."¹ If they truly remembered such things, he argues, such phenomena would not be so rare, but many persons would experience the same.

Perhaps the most serious criticism of Augustine's psychology of memory is that he almost entirely neglects the physiological side of the subject. He does not even notice the relation of memory to states of health or disease, and of youth or age. In one place, however, he states that memory has its seat in one of the three ventricles of the brain which is situated between that which is the seat of sensation and that which presides over locomotion, so that our movements may be co-ordinated.² Certainly in some passages he seems to make memory contain a kind of innate ideas that may be drawn forth by suggestion.³ But if here Augustine is unsatisfactory, it must be remembered that he is not writing a psychology, and that he was, as Ferraz calls him, a philosopher of transition. "He combats Plato's doctrine of reminiscence, and prepares the way for the innate ideas of Descartes, without positively enough rejecting the former and without clearly enough admitting the latter."⁴

The criticism has also been made that Augustine seems to waver in his conception of memory, that he sometimes represents it as the source of all our intellectual activity, comparing it among the other faculties to the Father in the Trinity, and that again he seems to limit this faculty to the work of preserving knowledge acquired empirically.

¹ De Trin., *L. XII, C. XV.* Haddon's translation.

² De Gen. ad Litt., *L. VII, C. XVIII.*

³ Conf., *L. X, C. X and XI.*

⁴ Ferraz, *op. cit.*, p. 192.

Without lingering upon the views of the other Church fathers,¹ Nemesis may be mentioned as an illustration of the continued Platonic influence. The soul is divided, according to him, into three parts, the perceiving (*φανταστικόν*), the thinking (*διανοητικόν*), and the remembering (*μνημονευτικόν*) faculties. The physiological basis of the third is the *pneuma* in the posterior ventricle of the brain. Besides the two aspects of memory usually mentioned, *i. e.*, retention and recollection, he treats reminiscence in the Platonic sense, *i. e.*, the becoming conscious of innate ideas.²

VII.—*Diseases of Memory mentioned by the Ancients.*

The pathological side of memory seems to have been little studied by the ancients. Augustine referred to the possibility of illusions of memory, in the passage already cited. Seneca tells of a certain Sabinus who had so bad a memory that he forgot the name of Ulysses, and again of Achilles, and sometimes of Priam, though he knew them as well as we remember our schoolmates.³ Some remarkable cases of amnesia were reported by the elder Pliny. "Nothing whatever in man," he says, "is of so frail a nature as the memory; for it is affected by disease, by injuries, and even by fright, being sometimes partially lost, and at other times entirely so. A man who received a blow from a stone forgot the names of the letters only; while on the other hand, another person who fell from a very high roof could not so much as recollect his mother, or his relations and neighbors. Another person, in con-

¹ For an interesting criticism of Plato's doctrine of oblivience, see Tertullian, *De An. Ch.* XXIV.

² Cf. Siebeck, *op. cit.*, 1er Th., 2te Abth., pp. 399, 400.

³ *Epistolae*, 27.

sequence of some disease, forgot his own servants even ; and Messala Corvinus, the orator, lost all recollection of his own name." While these cases are good illustrations of certain diseases of memory, they are not reported with sufficient accuracy and detail to render them of much scientific value. Ancient thinkers appear not to have appreciated the importance of studying the pathological conditions of memory.

VIII.—*Conceptions of Memory in the Middle Ages.*

The views of the scholastics need not detain us long. They seem to be generally developments, either of the views of Aristotle or of Plato and St. Augustine. Avicenna and others divided the inner or central sense of the Aristotelian psychology into five inner senses, of which one was memory. We have seen that, according to Aristotle's psychology, in perception the form or image of a thing enters the soul, being the subjective correlative of organic movements occasioned by external stimuli. In the scholastic psychology this view of perception becomes the doctrine of sensible species. The idea of memory held by many¹ was somewhat as follows : The impressions made by objects of sense are preserved by the mind. In recollection and imagination, the inner species corresponding to an external object can be formed by the aid of the physical organism without the actual presence of the object. The view of Albert the Great in regard to the localization of memory is interesting. The sensorium is in the anterior portion of the brain, judgment and the image-forming faculty farther back, and memory

¹ Cf. Siebeck, *op. cit.*, 1er Th., 2te Abth., pp. 418, 433, for the views of Hugo of St. Victor and Avicenna.

and recollection in the posterior portion.¹ The psychology of St. Thomas Aquinas, the famous pupil of Albert, is largely that of Aristotle. He speaks of the memory as the *vis apprehensiva præterita*, and connects it with the sensory side of the mind, through the common or inner sense.

Under the impulse of the Reformation, a new Aristotelianism arose. Its founder was Melancthon. He differs from Aristotle in making memory a function of the intellect, thus vindicating for it the immortality that Aristotle attributed to the active intellect.²

Ludovicus Vives, an Aristotelian of the sixteenth century, devoted considerable attention to memory and the association of ideas.³ He wrote in a practical way about memory, and was, perhaps, the first to mention that mnemonic device which so many have found useful, *i. e.*, the writing of what one would keep in mind. It is well, he says, to write what we would remember; the pen writes upon the heart as well as upon the paper. His doctrine of association is Aristotelian.

IX.—*Conceptions of Memory in Cartesian Philosophy.*

The notion of the correlation between physical and psychic processes was clearly understood by the dualists of the seventeenth century. Chauvin's *Thesaurus* speaks of a threefold memory—that of the mind exclusively, that of the body, and that of mind and body. Of the last he says: "Memory of the mind and of the body consists in a constant relation between the thinking of the former and the motion of the latter,

¹ Cf. Siebeck, *loc. cit.*, p. 431.

² Cf. Ueberweg, *Hist. of Phil.*, Vol. II, pp. 16-19.

³ Cf. his *Opera*, *passim*, Basileae, 1555.

such that when a thought is recalled a movement is renewed; for the one state seems to call forth the other."¹

Descartes explains the physical processes involved in memory in accordance with his crude physiology, and bridges the chasm between mind and matter with dogmatism. "When the mind wills to recall anything," he says, "this volition causes the pineal gland to incline itself successively this way and that, and impel the animal spirits to various parts of the brain until they come to that part in which are traces left by the object we would remember." The nature of these traces is explained as follows: The pores of the brain, through which the animal spirits have once passed, acquire a tendency to open again in the same way to them as they come again, so that these spirits finding the same pores again enter them more easily than others. "In this way the spirits arouse a special movement in the gland, which represents the same object to the mind, and shows it that the object is the same which it wishes to recall."² In the passages quoted it will be observed that the mental process is not put as the result of the physical process, as in some later writers, but rather the action of the mind is emphasized as originating the physical process. Really, however, in the Cartesian philosophy neither process was looked upon as originating the other, but the constant correlation between the physical and the psychic was attributed to the ceaseless action of the Deity.

This idea of God's mediation between mind and

¹ Chauvin: *Thesaurus Philosophicus*, Art. *Memoria*, Rotterdam, 1692.

² Descartes: *De Passionibus*, I, XLII.

matter was developed by Geulinx and Malebranche into the doctrine of occasional causes. On occasion of a physical process, God calls forth an idea in the mind. On occasion of a volition, God moves the body. This metaphysical doctrine must be borne in mind, especially in studying Malebranche's views of memory, or one may be tempted to see in them more than he meant to put there; for in some passages he writes in the style of modern psychology.¹ He treats the correlation (*liaison*) of ideas with traces in the brain and the correlation or association (*liaison*) of the traces with each other. The cause of the association of the traces in the brain, and of the corresponding ideas, is identity of time when the impressions were made. Traces impressed upon the brain simultaneously are revived together: for paths of association are opened between traces made at the same time, and the animal spirits can pass along these paths more easily than into other parts of the brain. Again, some of the traces are *naturally* associated one with another and with certain emotions, on account of an arrangement of the fibres that we have had from birth. Malebranche notices also the importance of the association of ideas in morals, politics, and all the sciences relating to man.

Malebranche's view of the physiological processes connected with memory is similar to that of Descartes, and he deems the comprehension of the truth that all our varied perceptions are dependent upon cerebral changes sufficient for the explanation of memory. For "the fibres of the brain having once received certain impressions by the course of the animal spirits and by the action of objects, retain for some time a facility for receiving the same modifications. Now

¹ Cf. *Recherche de la Vérité*, II, v, *passim*.

the memory consists merely in this facility, since one thinks of the same things when the brain receives the same impressions.”¹ The similarity of memory and habit as far as physiological processes are concerned did not escape the notice of Malebranche. In a sense memory is a kind of habit, and apart from consciousness there would be no difference between it and the other habits.² Making due allowance for metaphysical interpretations and the Cartesian hypothesis of animal spirits, such teachings show that Malebranche was a pioneer in the field of physiological psychology.

Spinoza's doctrine of memory is not very different from that of Malebranche, in spite of the difference in their philosophical systems. He is brief upon the subject, but explains the way the thought of one thing suggests that of another, and gives the essentials of the modern doctrine of the association of ideas. Memory depends upon this association of ideas ; “for it is nothing else than a concatenation of ideas implying the nature of things outside the human body, which is formed in the mind according to an order and concatenation of physical states.”³

¹ Op. cit., II, v, 3.

² Op. cit., II, v, 4 : Il est visible, par ce que l'on vient de dire, qu'il y a beaucoup de rapport entre la *mémoire* et les *habitudes*, et qu'en un sens la mémoire peut passer pour une espèce d'habitude. Car, de même que les habitudes corporelles consistent dans la facilité que les esprits ont acquise de passer par certains endroits de notre corps, ainsi la mémoire consiste dans les traces que les mêmes esprits ont imprimées dans le cerveau, lesquelles sont cause de la facilité que nous avons de nous souvenir des choses. De sorte que s'il n'y avait point de perceptions attachées aux cours des esprits animaux, ni à ces traces, il n'y aurait aucune différence entre la mémoire et les autres habitudes.

³ Ethices, Pars II, Prop. XVIII.

X.—*Views of Early English Writers and of Leibnitz.*

Bacon writes sensibly of memory, giving special attention to the "Helps of memory."¹ He speaks slightly of the mnemonic art as practiced in his day, esteeming the mnemonic feats of its devotees as no better than the "tricks and antics of clowns and rope-dancers." He was convinced that there might be better precepts and a better practice of the art than those in vogue. The art of memory, according to Bacon, is built upon what he calls Pre-notion and Emblem. Order, artificial places, and verse aid memory by giving a pre-notion of what the thing is we would recall. If we try to recollect a thing and have no pre-notion of what we would recall, "we seek and toil and wander here and there, as if in infinite space." But a pre-notion cuts off infinity and limits the range of memory. Emblem reduces intellectual conceptions to sense-images. We can remember an object of sense more easily than an object of the intellect. Hence the advantage of associating what is to be remembered with an emblem.

Memory has an important place among the faculties. In his psychology the three great powers of the human mind are Memory, Fancy, and Reason. Corresponding to this division of the faculties, he makes his famous threefold division of the sciences into History, Poetry, and Philosophy.

There is little new in the psychology of memory taught by Hobbes.² It is essentially that of Aristotle. All our knowledge originates in sense. The cause of sensation is physical motion. Memory and imagination are "decaying sense." "This *decaying sense*,

¹ Cf. especially De Aug., V, 5; Nov. Org., II, 26.

² Cf. Human Nature, *passim*.

when we would express the thing itself, I mean *fancy* itself, we call *imagination* . . . but when we would express the decay, and signify that the sense is fading, old, and past, it is called *memory*." Thus memory and imagination are one thing with different names. Again, he terms remembrance a sixth sense, because it is concerned with the past. Names according to him are chiefly mnemonic devices. And he writes in Aristotelian fashion upon the association of ideas.¹

The next English philosopher to be considered is Locke. He uses metaphorical language in discussing memory, speaks of the "repository of the memory" and the "constant decay of all our ideas, even of those which are struck deepest," says that when the ideas are not renewed "the print wears out," that "the pictures drawn in our minds are laid in fading colors," that "our minds represent to us those tombs to which we are approaching, where though the brass and marble remain, yet the inscriptions are effaced by time and the imagery moulders away," that in recollection our ideas are often "roused and tumbled out of their dark cells into open daylight by turbulent and tempestuous passions." But these are merely figures of speech. The psychology of Locke is very different from that of the Cartesians or that of Leibnitz. Not only has the mind no innate ideas, but it has no unconscious ideas. The pith of his doctrine of memory is expressed in the following passage : "But our ideas being nothing but actual perceptions in the mind, which cease to be anything when there is no perception of them, this laying up of our ideas in the repository of the memory signifies no more but this, that the mind has a power in many cases to revive perceptions which it has once

¹ Human Nature, IV, 2 ; also Leviathan, Ch. III.

had, with this additional perception annexed to them, that it has had them before. And in this sense it is that our ideas are said to be in our memories, when indeed they are actually nowhere, but only there is an ability in the mind when it will to revive them again, and as it were paint them anew on itself, though some with more, some with less difficulty ; some more lively, and others more obscurely." Locke distinguishes in the general faculty of *retention* two kinds of activity : First, the keeping of ideas for some time before the mind. This is *contemplation*. Second, the reviving of ideas without the help of the objects which first caused them. This is *memory*. Attention, repetition, pleasure and pain are the means of fixing ideas.

Locke does not discuss the physiological aspects of memory, but, from pathological phenomena, concludes that the constitution of the body may influence the memory. And from observation of animals, especially of birds learning tunes, he infers that several other animals as well as man have the faculty of retention. His chapter upon the association of ideas is a suggestive discussion of the influence of the habitual union of ideas upon the opinions, reasonings, and actions of men.¹

Leibnitz not only opposed the empiricism of Locke and argued for innate ideas, or at least natural dispositions and tendencies, but he combated the notion that by memory we mean merely the faculty of recalling ideas at pleasure, the ideas having no existence when not before the mind. "If nothing remained," he says, "of past thoughts as soon as we cease to think of them, it would not be possible to explain how

¹ Essay concerning Human Understanding, Book II, Chaps. X, XIX, XXXIII.

one retains the memory of them ; to have recourse to that bare faculty for explanation, is to say nothing intelligible." Leibnitz favored rather the Cartesian hypothesis, that the conditions of memory are traces or dispositions left in the soul as well as in the body by former impressions. These traces remain, though we are unconscious of them ; and also the effects of things we cannot recall may remain in the mind.¹

Wolff, the disciple of Leibnitz, makes memory a faculty of the soul, and the Leibnitzo-Wolffian psychology prevailed in Germany until Kant.

XI.—*Conceptions of Memory in the 18th Century.*

The historical study of memory has more than a psychological interest. The subject is connected with some of the profoundest questions of philosophy. About it materialists against idealists, and empiricists against nativists, have fought their battles. The doctrine of the Cartesians, that memory was conditioned by traces left in the brain, was developed by the physiologists and Encyklopedists of the 18th century into a materialistic and mechanical view of memory. Sometimes the help of mathematics was sought to make the mechanical view more definite. The physiologist Haller performing the first experiments upon the time occupied in psychic processes, had estimated that a third of a second was sufficient time for the production of one idea. On this basis Hook and others reckoned that in a hundred years a man must collect 9,467,280,000 traces or impressions of ideas in his brain. Reducing this to a third on account of sleep, etc., one has 3,155,760,000, or in fifty years 1,577,880,000 traces. Assuming the weight of the brain to be four pounds,

¹ *Nouveaux Essais*, I, iii. 18, and II, x. 2.

and deducting one pound for the weight of the vessels and blood, and another for the weight of the cortex (which, strangely enough, they thought did not have the power of preserving impressions), 205,542 traces must be found in one gram of the nerve-substance of the brain.¹ Haller, however, while basing memory upon traces in the brain, admitted his ignorance of the nature of these traces, and opposed materialism.

Condillac is, perhaps, the best representative of the psychology of the Encyklopedists. In his famous statue gradually endowed with sense he traces the development of memory and imagination.² When the statue is endowed with the sense of smell, he says that this supposed man would have no knowledge of the relation of things without memory. He would suffer and rejoice without having either desire or fear. "But the odor which the statue perceives does not entirely escape from it as soon as the odorous body ceases to act upon its sense-organ. The attention bestowed upon the sensation retains it still; and there remains an impression, more or less strong according as the attention itself has been more or less active. This is memory."³ When the statue perceives a new odor, that which it had a moment before is still present. The power of perceiving is divided between the remembered sensation and the present odor. The statue compares the two and learns to judge. By repeated exercise, acts of memory, comparison, and judgment become habitual. At the first sensation experienced, the statue has no surprise, for it has been accustomed to no other sensation; but when it passes from an

¹ Cf. Huber: Das Gedächtniss, p. 21.

² *Traité des Sensations*, passim.

³ *Qp. cit.*, Part I, Ch. II, §6.

accustomed to a totally different state, then it experiences surprise. Surprise arouses the attention. If the odors equally attract the attention, they are stored in memory in the order of their succession. If there are a great many impressions in the succession, then the last and the most novel will be the strongest. In memory, then, we have a series of ideas which form a kind of chain. This linking of the ideas furnishes the means of passing from one idea to another and of recalling the most distant. The great law of association of ideas is coexistence in time. Two degrees in the power of recollection may be distinguished: one weak, where a thing is recalled as past; the other strong, where a thing is recalled so vividly that it seems to be present. The one is called memory, the other imagination. These two faculties differ only in degree. Memory is weak imagination. Imagination is the most vivid kind of memory.¹

The great mystery of memory, Condillac treats as follows. Where, he asks, is the idea of a thing when for a long time the mind does not think of it? It is not in the mind; for disease can destroy the power to recall it. It is not in the body. Only a physical cause could preserve it there; and it would be necessary to suppose that the brain remains in exactly the same state in which it was put by the sensation which the statue would recall. Moreover, it would be difficult to reconcile this hypothesis with the continual movements of the animal spirits, and with the multitude of ideas with which memory is enriched. Condillac gives what he deems a simpler explanation. "I have a sensation," he says, "when a movement occurs in one of my organs and is transmitted to the brain. If the

¹ Op. cit., I, ii. 29.

same movement begins in the brain and is propagated to the sense-organ, I believe that I have a sensation that I do not have: it is an illusion. But if this movement begins and ends in the brain, I remember the sensation that I have had. When an idea returns to the statue, it is not that it has been preserved in the body or in the mind: it is only because the movement which is the physical and occasional cause of it, is reproduced in the brain.”¹

Although, for the sake of simplicity, Condillac first endows his supposed statue with the sense of smell, and traces the development of memory while it has this one sense, he looked upon the sense of touch as the basis of all the ideas we retain in memory, and thought the memory of the ideas which arise from touch stronger and more enduring than that of ideas coming from the other senses.²

Helvetius considers a few special points.³ He attempts to show that a great intellect does not necessarily imply a great memory, and concludes that, on the contrary, extreme capacity of the one is exclusive of great capacity of the other. The relation of memory to the intellect is expressed in the following sentence: “Memory is the storehouse where are deposited sensations, facts, and ideas, the various combinations of which form what we call intelligence (*esprit*).”

Helvetius considers that memory is almost entirely factitious. The great differences in memory among educated men are due less to differences of natural endowments than to different degrees of training. Men with feeble memories, like St. Augustine and

¹ Op. cit., I, ii. 38.

² Op. cit., Partie II, Ch. XI.

³ Discours de l'esprit; disc. III, c. 3.

Montaigne, learned much on account of their great desire to learn. The capacity of memory depends upon three things—on the daily use of it, on attention, on the order in which one arranges one's ideas. He emphasizes the last. A great memory is, as it were, a phenomenon of order.

Helvetius further attempts to prove that all men are endowed with sufficiently good memories to enable them to attain a high degree of intellectual culture. "Every man," he argues, "is really sufficiently favored by nature in this respect, if the storehouse of his memory is capable of containing such a number of ideas or facts that by constantly comparing them he can always perceive some new relation, always increase the number of his ideas, and consequently always increase the capacity of his intellect. Now, if thirty or forty objects, as geometry shows, can be compared in so many ways that, in the course of a long life, no one can observe all their relations nor deduce all the possible ideas from them ; and if among men whom I call well endowed (*bien organisés*), there is no one whose memory cannot contain, not only all the words of a language, but also an infinity of dates, facts, names, places, and persons, and, finally, a number of objects considerably more than six or seven thousand, I conclude confidently that every well-endowed man is given a capacity of memory far beyond what he can make use of for increasing his ideas ; that greater capacity of memory would not give greater capacity of intellect ; and thus that, instead of regarding the inequality of memory in men as the cause of the inequality of their intellects, this latter inequality is entirely the result, either of the attention, greater or less, with which they observe the relations of objects,

or of the bad choice of objects with which they load their memories. There are, indeed, barren objects, and those, such as dates, names of places, persons, and other like things, which occupy a large place in the memory without being able to produce either a new idea or one interesting to the world . . . This is why one is seldom a great man who has not the courage to be ignorant of an infinite number of useless things.”¹

One of the greatest physiologists and thinkers of the eighteenth century was Bonnet. His views of memory are much like those of Condillac.² Yet he opposes materialism, and claims that man is no more all matter than all spirit; he is rather an *Etre-mixte*. Bonnet’s method was, he says, to look for the immediate antecedents of a thing. Before searching for the way an idea was reproduced, he inquired how it was produced. All our ideas, according to Bonnet, are derived from sense. The kind of sensation depends upon the anatomical structure of the sense-organ. Not only do the different sense-organs have different nerve-structure, but the fibres of the same sense-organ vary in structure.³ The phenomena of refrangibility of the rays of light and the vibration of the cords of sonorous instruments strengthened this conjecture. “Each perception,” he says, “has its character which distinguishes it from every other. For example, each ray of color has its essence, which is invariable. A red ray does not have

¹ Discours de l’esprit; disc. III, c. 3.

² Cf. Contemplation de la Nature, Part V, Ch. 6; Essai de Psych., Ch. 4, 5, 6, 27, 31; Essai analytique sur l’âme, Ch. 7-9; Analyse abrégée de essai analytique, ¶7-11; Essai d’application des Principes Psych. de l’Auteur, passim; Philalethe, Ch. 3; Palingénésie, Part II, Ch. 1.

³ Analyse abrégée, ¶ IX: “Si chaque sens a sa mécanique, j’ai cru que chaque espèce de fibre sensible pourrait avoir la sienne.”

precisely the same effect as a blue ray. There are then also, among the sight fibres, differences corresponding to the differences in the rays.”¹

The physical correlative of a sensation is a movement or vibration in the fibres of the sense-organ. The reproduction of a sensation likewise depends upon a physiological process. Memory and imagination have their seat in the body. This is proved by pathological cases in which accidents affecting only the body weaken and destroy these powers. Anticipating Bain, he says that the reproduced impression depends upon the vibration of the same nerve-fibres as transmitted the original impression to the mind.² The fibres that transmit and reproduce impressions have a structure adapted to this double function. “The sense-fibres are constructed in such a way that action more or less prolonged of objects produces in the fibres determinations more or less durable.” Admitting his ignorance of the structure of the sense-fibres, Bonnet did not venture to explain the nature of these determinations.

His general doctrine of the physics of memory is well expressed in the following passage : “Not only does the fibre transmit to the mind the impression of the object ; but it also retraces the memory of that impression. This memory differs from the sensation itself only in the degree of intensity. It has then the same origin ; it then, as well as the sensation, depends upon

¹ The doctrine of specific nerve energy here expressed is noteworthy. Cf. also *Contemplation de la Nature*, Tome I, pp. 97 and 98, 2d ed., Amsterdam. “Chaque sens renferme donc probablement des fibres *spécifiquement* différentes. Ce sont autant de petits sens particuliers, qui ont leur manière propre d’agir, et dont la fin est d’exciter dans l’âme des perceptions correspondantes à leur jeu.”

² Analyse abrégée, ¶ IX : “C’est à l’ébranlement de certaine fibres, que cette sensation a été originairement attachée. Sa *réproduction* ou son rappel par l’imagination, tiendra donc encore à l’ébranlement de ces mêmes fibres.”

a movement excited in the fibre, but a feebler movement. The execution of this movement demands a certain disposition in the constituent parts of the fibre. The elements retain then, for a longer or shorter time, the determinations which they have received from the action of the object. It strings the fibre, so to speak, to its tone ; and, as long as the fibre remains thus strung, it preserves a tendency to retrace to the mind the memory of the sensation from the object.”¹ From the passage just quoted we see that, when a vibration has once occurred, a certain flexibility imparted to the nerve makes it easier for the same vibration to occur again than for a new movement to take place. This increased facility of vibration is the cause of our recognizing a sensation or an idea when it occurs a second time.²

The connection between habit and memory, which Malebranche had so well pointed out, did not escape the observation of Bonnet. He saw, too, that the nerves depend upon nutrition, and that they retain in growth their functional dispositions. To quote his words : “The sense-fibres depend upon nutrition like all the other parts of the body ; they assimilate or incorporate alimentary substances ; they grow ; and, while receiving nutriment and growing, they perform their peculiar functions, and remain in essence unchanged. Their mechanism is, then, such that they incorporate nutriment in direct conformity with their structure and their acquired tendencies. Thus nutrition tends to preserve in the fibres these tendencies and cause them to take root ; for they increase in stability in proportion as the fibres grow, and, I believe, we see here the

¹ Analyse abrégée, ¶ X.

² Cf. Essai de Pysch., Ch. V ; and Essai an. sur l'âme, Ch. IX.

origin of habit, that powerful queen of the sentient and intelligent world.”¹

The views of Bonnet, probably more than of any other philosopher we have studied, have the ring of modern physiological psychology. He announces clearly that psychic processes have their correlative in physical processes. The brain is the organ of mind. And the tenacity of memory depends upon the ability of the brain elements to retain determinations imparted to them. As the tendencies to particular modes of vibration preserved in the brain were caused by the action of external objects, it is, in a sense, a mirror of a portion, larger or smaller, of the universe. In writing of this Bonnet grows eloquent. “What images,” he exclaims, “are those in the brain of a Homer, a Virgil, or a Milton! What mechanism executes those marvellous scenes! The intelligence which could have read in the brain of Homer, would have seen the Iliad represented by the varied play of a million fibres.”²

It should be noticed especially that Bonnet was not a materialist. He was, however, ready to accept any results that investigation might furnish. His fearless attitude toward materialism may be inferred from the following passage: “If some one should ever demonstrate that the soul is material, far from being alarmed at it, one should wonder at the power which had given matter the ability to think.”³

Among English philosophers of the eighteenth century, Hume has something to say about memory and the association of ideas.⁴ He reverses the distinction

¹ *Contemplation de la Nature*, Tome I, pp. 99 and 100, 2d ed.

² *Ibid.*

³ *Analyse abrégée*, ¶ XIX.

⁴ Cf. especially *Treatise of Human Nature*, I, iii. 5; I, i. 3 and 4.

that Condillac makes between memory and imagination. The difference lies in the “superior force and vivacity” of memory. “A man may indulge his fancy in feigning any past scene of adventures; nor would there be any possibility of distinguishing this from a remembrance of a like kind, were not the ideas of the imagination fainter and more obscure.”¹ The ideas of memory often degenerate and we are unable to distinguish them from the ideas of fancy. On the other hand, illusions of memory are possible. “An idea of the imagination may acquire such a force and vivacity as to pass for an idea of the memory, and counterfeit its effects on the belief and judgment. This is noted in the case of liars, who, by the frequent repetition of their lies, come at last to believe and remember them as realities; custom and habit having in this case, as in many others, the same influence on the mind as nature, and in fixing the idea with equal force and vigor.”²

The laws of association according to which simple ideas are united into complex ones are three in Hume’s psychology—*resemblance*, *contiguity* in time or place, and *cause* and *effect*. The last is most extensive. Even here, however, there is no necessary connection; but the idea of causality is the result of an experience of uniform sequence. Of association he says in a famous passage: “Here is a kind of *attraction*, which in the mental world will be found to have as extraordinary effects as in the natural, and to show itself in as many and various forms.”³

Hume discusses the relation of memory to the prob-

¹ Op. cit., I, iii. 5.

² Ibid.

³ Op. cit., I, i. 3.

lem of personal identity. Memory is the chief source of personal identity, because it makes known to us the extent and continuity of the succession of our perceptions. But it does not produce, it rather *discovers* to us personal identity, by showing us the relation of cause and effect among our perceptions. "Who can tell me," asks Hume, "what were his thoughts and actions on the first day of January, 1715?" Nevertheless, though one cannot recall what he did on a given date several years in the past, yet no one doubts the identity of that past self with his present self. Thus Hume argues: "It will be incumbent on those who affirm that our memory produces entirely our personal identity, to give a reason why we can thus extend our identity beyond our memory."¹

Hartley, the eminent English physiologist, in accordance with the general principles of his psychology, outlines an interesting form of the vibratory theory of memory² not essentially different from that of Bonnet. Influenced by Newton, he believed that ether pervades all things, even the most solid bodies. In sense-perception, vibrations imparted by the ether are transmitted by the nerves to the brain and there transmuted into sensations. The sensation is the subjective aspect of the vibration. When the sensory vibrations cease, dispositions to diminutive vibrations persist in the medullary substance of the brain. These diminutive vibrations, the physical correlatives of decaying sense, Hartley calls vibratiuncules. They are the condition of our ideas. The vibratiuncules from sensations that were simultaneous or successive become associated, so that we have clusters of impressions and complex

¹ Op. cit., I, iv. 6.

² Cf. Observations on Man, Sect. IV., Prop. XC.

ideas. In memory the vibratiuncules are renewed, and the same ideas and clusters of ideas are revived.

Memory depends entirely upon the state of the brain. For it is impaired or destroyed by diseases, concussions of the brain, spirituous liquors, and the like, and generally returns with the return of health. If sensations and ideas arise from vibrations and dispositions to vibrate in the medullary substance of the brain, it is easy to see that these causes would disturb the order of ideas.

From the subjective standpoint Hartley defines memory as "that faculty by which traces of sensations and ideas recur or are recalled in the same order and proportion, accurately or nearly, as they were once actually presented."¹ Thus memory is based upon the association of ideas. The great law of association is that of contiguity in time or space. Hartley considered at great length the association of the vibratiuncules, and of the corresponding ideas, attempting to show that all reasoning and affection are the result of association. He at least succeeded in laying the foundation of the modern Associational Psychology.²

Hartley considers the various phenomena of memory, such as the defects of memory in children, old people, and diseased persons, and tries to make them tally with his theory. According to his psychology, memory is a fundamental power of the mind. All our voluntary powers are of the nature of memory. The results of observation in pathological cases agree with this; for in diseases of memory the voluntary actions

¹ Op. cit., Introduction, p. 2.

² For a good history of the doctrine of association of ideas see Ferri: *La Psych. de l'Association depuis Hobbes jusqu'à nos jours*; also for older views, Hissmann: *Geschichte der Lehre von der Association der Ideen*; Göttingen, 1777.

are imperfect. Taking memory in a large sense, all the powers of the soul may be referred to it. Thus strong power of retention is indispensable to strong judgment; and though some persons with weak judgments may have strong memories, no one with a weak memory can have a strong judgment.

It is interesting to note, in connection with such studies as those recently made by Kraepelin,¹ that Hartley, as well as Hume and others, noticed the possibility of illusions of memory. The difference between memory and reverie consists, he thinks, in the greater vividness of the clusters of memory pictures, and principally in the readiness and strength of the associations by which they are united. Many persons, he points out, are known by some false story that they relate over and over. By magnifying the ideas and associations they at last come to believe that they remember what they tell. The story makes as vivid an impression on them and hangs as closely together as any assemblage of past facts in their memory. Thus "all men are sometimes at a loss to know whether clusters of ideas that strike the fancy strongly, and succeed each other readily and immediately, be recollections or mere reveries. And the more they agitate the matter in the mind, the more does the reverie appear like a recollection." As when in endeavoring to recollect a verse, a wrong word suiting the place, and afterward the right one occurs, one sometimes becomes confused, and for the moment it is hard to distinguish the right one. "Persons of irritable, nervous systems are more subject to such fallacies than others. And madmen often impose on themselves in this way, viz., from the vividness of

¹Archiv f. Psychiatrie, 1886 and 1887.

their ideas and associations, produced by bodily causes. The same thing often happens in dreams. The vividness of the new scene often makes it appear like one that we remember and are well acquainted with."

XII.—*Mnemonic Systems.*

No historical sketch of the doctrines of memory among the older writers would be complete without some mention of their mnemonic systems. The art of mnemonics seems to have been much in vogue among the ancient Greeks and Romans. Every scholar of the classics is familiar with the story that ascribes the invention of the art to Simonides. There are allusions to this art in the works of Aristotle, Plato, and other classic writers. Aristotle is reported by some to have written a work upon mnemonics. Cicero and Quintilian give special attention to the subject.¹

The main principles of the ancient mnemonic systems were somewhat as follows: The thing to be remembered was localized by the imagination in some definite place—say in a room of a real or imaginary house; and, if necessary, a concrete symbol as vivid as possible was associated with it. Often a large house was visualized in the imagination, and the rooms, walls, furniture, statues, etc., associated with things to be remembered. To recall anything it was only necessary to rummage about in this imaginary house until one found what was desired. This device was much used among the Romans as an aid to oratory; and it has been said that the phrases, *in the first place, in the second place*, and the like originated in this ancient practice.

¹ Cicero: *De Oratore*, II, 86–88; *Rhet. ad Herenn.*, III, 16–24. Quintilian: *Inst.* XI, 2. Cf. also Pliny: *Hist. Nat.*, VII, 24.

From the fifth to the thirteenth century the mnemonic art may have been practiced in the monasteries, but we hear little of it. In the thirteenth and fourteenth centuries the ancient systems were revived. Roger Bacon was one of the writers upon the subject; but his work was never printed, though it is said to be still preserved in MS. at Oxford. Toward the close of the fifteenth century the famous teacher, Petrus de Ravenna, appeared, and the first edition of his *Ars Memorativa* was published in 1491. In the sixteenth and seventeenth centuries a great many books upon mnemonics were published. Among the most important were the works of Lamprecht Schenkel and Giordano Bruno. Winkelmann and Leibnitz invented, or borrowed from the Hebrew Bible, the device of representing figures by letters. And later Grey made special application of this principle in his *Memoria Technica* which appeared in 1730.

The character of some of the mnemonic teachers of this period may be inferred from the following passage from Cornelius Agrippa's *De Vanitate Scientiarum*. Speaking of the vanity of the mnemonic art where there is not a good natural memory to begin with, and of the authors who have written upon the subject, he says: "Many there be that at this day profess the same, though they get more infamy and disrepute than gain thereby; being a sort of rascally fellows that do many times impose upon silly youth, only to draw some small piece of money from them for present subsistence."¹ There is at least this difference between the mnemonic teachers of Agrippa's time and those of the present. The latter generally get, not a small

¹The Vanity of Arts and Sciences; Eng. translation: London, 1676. For a modern example of the mnemonic money-getter, see "*Loisette*" *Exposed*, by G. S. Fellows; New York, 1888.

piece of money, but a large piece, and they sometimes impose upon others as well as silly youth.

Most of the systems taught before the time of Grey seem to have differed little from the ancient systems. Localization and visualization were the characteristics of them. Sometimes mnemonic towns, with numerous streets, squares, and buildings, were formed. By continued thought the mnemonic expert became at home in this imaginary town. It was laid out probably according to the classification of the sciences, and by this device the abstract was associated with the concrete, and the imagination brought to the aid of memory.

The ancient and mediæval systems of mnemonics are inferior to the best modern systems, especially that of Pick,¹ which is based upon sound psychological principles. But they were probably very helpful to eye-minded people. The men with remarkable memories mentioned by Cicero and others probably owed much to mnemonic aids. It is of special psychological interest to consider the ancient mnemonic devices in connection with such studies as those of Galton upon mental imagery, number forms, and the like.² The prevalence of these systems may indicate that the faculty of visualization was highly developed in many of the ancient Greeks and Romans, and among the devotees of their mnemonic systems in the Middle Ages.³

¹ Pick : *Memory and the Rational Means of Improving it*. London, 1861.

² *Enquiry into Human Faculty*, p. 83 seq.

³ Ersch and Gruber mention some 140 works upon mnemonics ; see their *Allgemeine Encyclopädie*, art. *Gedächtnisskunst*. Pick says that Aimé Paris gives a list of 300 works on memory and on mnemonics. G. S. Fellows, in "*Loisette*" *Exposed*, gives a bibliography of 247 works on mnemonics and the training of memory. Cf. also on the history of mnemonics, *Enc. Brit.*, art. *Mnemonics* ; Pick, *Memory*

XIII.—*Conclusion.*

The material contained in the foregoing pages, meagre though it is, may be taken as fairly illustrative of the conceptions of memory that have prevailed from the earliest times until the great era in philosophy marked by the appearance of the Critique of Pure Reason. Whether or not we agree with Emerson that all men may be divided into Platonists and Aristotelians, the various theories of memory studied naturally divide into two series—one begun by Plato, the other by Aristotle—the former transcendental, the latter physiological and empirical in its tendency. Plato, the Neo-Platonists, St. Augustine, Leibnitz regard memory as an act of the soul, limited, perhaps, by physiological processes, but not dependent upon them. Sensation may furnish memory the data in great part, yet memory belongs not to the sensory but to the intellectual part of the mind. On the other hand, according to Aristotle, Thomas Aquinas, Hobbes, Condillac, Bonnet, and others (making allowance for differences of opinion due to their individual systems), memory belongs to the sensory side of the mind. The images of memory and the imagination are the relics of former sensations. The sensations were due originally to physiological processes. The reproduced images depend upon physiological processes, weaker, but not essentially different from the original ones.

The theories of memory that we have studied may be of little value in themselves, but they form a part of the data necessary for a complete study of the psychology of memory. These theories were formed

and its Doctors; Aretin, *Systematische Anleitung zur Theorie und Praxis der Mnemonik*, Sulzbach, 1810; Middleton, *Memory Systems New and Old*.

very much as we form our theories to-day, *i. e.*, by generalization from observed facts—with less of scientific rigor probably, with the usual coloring of the thinker's mental environment, and with the peculiar ornaments of the individual apperception. But, if "million-eyed observation" is better than the observation of any one man, if the experience of the race is more trustworthy than that of the individual, then a theory, though worthless as such, may be valuable because containing, however obscurely, a record of the observation and experience of the times when it was formed. Most of all, however, a theory, worthless in itself, may be valuable as an instance of the working of the human mind before one of the greatest problems of psychology. A great number of such instances may prove valuable for psychological study in the same way as the myths of savage tribes and the records of child-life.

Aristotle's doctrine of memory, for example, as a theory is partly false ; but it is a remarkable instance of the tendency of the human mind to find satisfaction in resolving all mysteries back to the one supreme mystery of motion. This conception of motion played its part, too, in the systems of the Middle Ages. Hobbes made motion the basis of his system. The motion of the animal spirits was the occasion of psychic activity according to the Cartesian psychology. Memory as reproduced movement was the theory that gave most comfort to Condillac. And with Bonnet and Hartley memory is the result of persisting vibrations in nerve-substance. This theory has been taught, in one form or another, by many physiologists ever since. That so many thinkers have found the explanation of memory in motion is profoundly suggestive. The

human mind has a passion for unity. If it cannot solve all its difficulties, it likes to collect them under one all-embracing mystery. This appeases the desire for unity, and economizes energy. Psychologically considered, the category of motion is an economic device that satisfies the Aristotelian mind.

Equally worthy of study are those theories that see in memory an activity independent of physiological processes, a transcendental function of the timeless and spaceless intellect.

In recent years the subject of memory has broadened. It is now connected with some of the most profound questions of psychology and biology. As the knowledge of these sciences has advanced, the importance of the study of memory has increased. Yet it is noteworthy that the beginning of the newer views is found in the doctrines of the older writers studied in this article.